Title: Symmetry in Your World

Brief Overview:

This unit focuses on symmetrical shapes and objects in the real world. After students complete this unit, they will be able to apply their knowledge of symmetry to real world objects. Students will learn how to identify the lines of symmetry as well as complete the missing halves of symmetrical figures.

NCTM Content Standard/National Science Education Standard:

Geometry

Grade/Level:

Grade 3

Duration/Length:

Three 50-60 minute lessons, which includes Assessment

Student Outcomes:

- Students will define a line of symmetry in order to identify lines of symmetry within given shapes and real world examples.
- Students will determine the number of lines of symmetry within a given set of shapes.
- Students will complete the missing half of a symmetrical object by applying their understanding of symmetry.

Materials and Resources:

- Student Resources 1-14c
- Teacher Resources 1-11
- Transparencies of specific teacher resources
- List of links (see end of unit plan)
- Sandwich sized baggies
- Mirrors
- Pattern blocks

Development/Procedures:

Lesson 1

Pre-Assessment –

- Display large Navajo rug pictures (See Teacher Resources 1a-c) on board and hand out small sets for each group (See Student Resource 1). Have

groups discuss characteristics of the rugs, i.e. shapes, patterns, colors, etc. and share.

- Guide students to look for things that are similar in the three rugs. Present the idea of folding the rug in half vertically and discuss what they notice. Do the same, folding horizontally.

Launch-

- Discuss what the folds of the rugs could be called and what they do.

- Present vocabulary: symmetry and line of symmetry (See Student Resource 2). Students will complete vocabulary icons on the following day.

- Discuss what it means for shapes or figures to be symmetrical or for shapes to have symmetry.

- Exploration through Yes/No sort: Using different shapes and real life figures that have different numbers of lines of symmetry, the students must determine the rule for how the teacher is sorting the shapes and figures on the overhead. Students will have shapes in front of them to manipulate. Rule: Shapes and figures that have more than one line of symmetry (See Teacher Resources 2 & 3 and Student Resource 3).

Teacher Facilitation –

- Teacher modeling: Use shapes from sort to show how to find the lines of symmetry. Demonstration of folding, sides matching, etc. to explain why the shapes follow the rule.

- Next, use cutout alphabet letters to find lines of symmetry for the letters A, B, C, and D (See Teacher Resource 4. See Symmetry PowerPoint-Teacher Link 1 below for answer key). Students will be recording the lines of symmetry for each letter on their "Alphabet Symmetry" worksheet (See Student Resource 4).

Student Application –

- Have students complete the rest of their chart, using the remaining alphabet letters, which will be provided in baggies for each group (Student Resource 5).

- For those who finish early, instruct them to complete the "Symmetry Scavenger Hunt," in which students find classroom objects that are symmetrical (See Student Resource 6).

- Bring class back together to check answers. Use the PowerPoint slide, "Symmetry PowerPoint," which shows the correct lines of symmetry for each letter (See Teacher Link 1).

Embedded Assessment –

- Students complete Exit Card. (See Student Resource 7 and Teacher Resource 5).

Reteaching/Extension –

- **Reteaching**: During student application, those students who are having difficulty will work in a small group with the teacher, using cut-outs of basic shapes to identify lines of symmetry. (See Student Resource 8 and Teacher Resource Sheets 6 & 7).

- **Extension:** Students complete an interactive symmetry activity that is found on Student Link 1. http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html

Lesson 2

Preassessment –

- Students share the vocabulary icons they created yesterday for their Exit Card. The class will come to a decision as to which icon will represent the definitions of "line of symmetry" in the classroom. The class will also create an icon for the term, "symmetry," and discuss why these icons help them remember what the terms mean.

Launch –

- Have the students Think-Pair-Share for examples of everyday objects that have symmetry.

- Show the interactive site, Teacher Link 2. (http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html and complete the interactive activities as a whole group. Stop after the presentation of road signs.

- Distribute mirrors and worksheet of half shapes/figures (See Student Resource 9). Have students explore what a mirror can do when given a half-shape (*provides a symmetrical shape).*

- Students will come to the conclusion that a mirror helps to find the line of symmetry within a symmetrical object.

Teacher Facilitation –

- Discuss what was noticed within the exploration. Explain that a mirror can help you visualize the missing half of a symmetrical shape.
- Model how to draw the missing half using a mirror for reference, if needed.
- Also, use a think-aloud to help explain how to complete a missing side of a symmetrical shape using the grids (square or triangular) for guidance, without using a mirror (See Teacher Resource 8).

Student Application –

- Have students work in partners to complete the missing side of symmetrical designs using pattern blocks (See Student Resources 10a-c). Students can use mirrors as needed to check their design (See Teacher Resource Sheets 9a-c for answer keys).
- Instruct students to work independently in order to complete the missing side of symmetrical designs on grid paper (See Student Resource Sheet 10d and Teacher Resource Sheet 9d).

Embedded Assessment –

- Students choose three out of four everyday objects in which they will complete the missing symmetrical half (See Student Resources 11 a-b and Teacher Resources 10 a-b).

Reteaching/Extension –

- **Reteaching**: For students having difficultly with the independent practice, they will be pulled in a small group. They will complete a matching activity in which they will manipulate halves to make a symmetrical whole (See Student Resource 12).
- **Extension**: "Symmetry Sense" (See Student Resource 13). Students will create symmetrical designs incorporating different money amounts.

Summative Assessment: (See Student Resources 14 a-c and Teacher Resources 11)

The assessment uses a variety of measures that align with the Maryland State Assessment. Part A asks students to complete the missing halves of symmetrical figures. This shows the students' ability to recognize that symmetrical figures have congruent sides. Part B contains selected response questions, in which the

students must identify the correct number of lines of symmetry within a given shape or figure. Part C is a brief-constructed response, in which students must determine whether the given lines of symmetry are drawn correctly. They must then explain why their answer is correct using what they know about symmetry and lines of symmetry. The variety of questions enables the teacher to determine if students have met the objectives of the two-day lesson. Students who complete the assessment with time leftover can explore the given interactive symmetry sites listed below.

Teacher Links:

Teacher Link 1: [Symmetry PowerPoint] Symmetry powerpoint.ppt
Teacher Link 2:
http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html

Other Teacher resources:

http://www.scottkim.com/inversions/resources.html

Student Links:

Student Link 1:
http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html

http://www.arcytech.org/java/patterns/patterns_j.shtml - interactive site where students manipulate pattern blocks and can make symmetrical pictures online

http://www.adrianbruce.com/Symmetry/index.html

http://britton.disted.camosun.bc.ca/jbsymteslk.htm#ACTIVITY2

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Navajo Rugs

(Cut out one row for each group)

Reference: http://www.mpsaz.org/arts/elements/balance/page1.html

Student Vocabulary Icons

(For students to draw class icon and glue in math journal)

Symmetry:

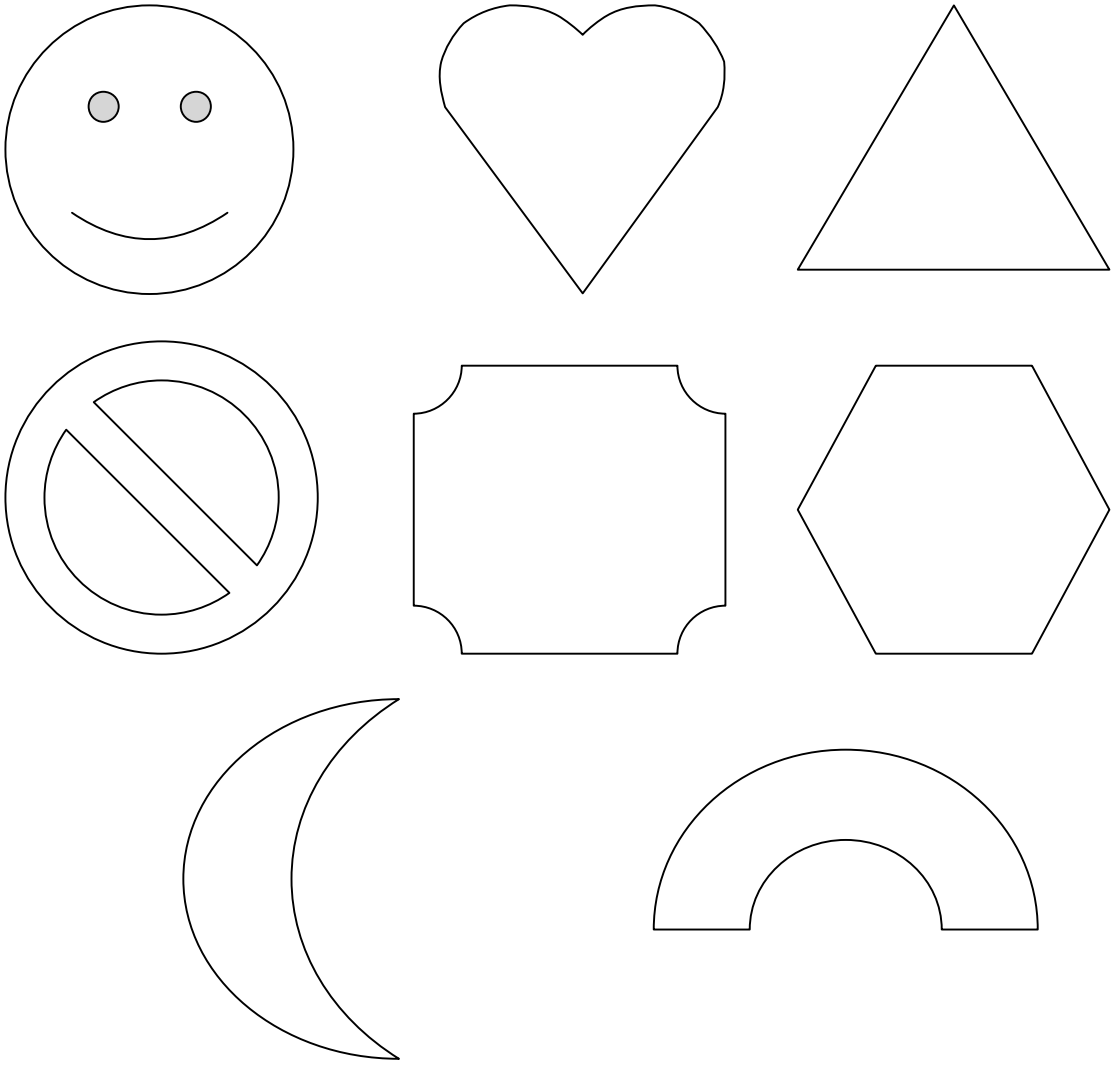
When one half of a figure looks like the mirror image of the other half

Line of symmetry:

An imaginary line that divides a figure into two matching sides

Symmetry Sort: Shapes

Teacher Prep: 1. Make an overhead of this and cut out the shapes. 2. Cut out shapes and put in baggies for each group.



Alphabet Symmetry

A B C D E F

___ ___ ___ ___ ___ ___

G H I J K L

___ ___ ___ ___ ___ ___

M N O P Q R

___ ___ ___ ___ ___ ___

S T U V W X

____ ___ ___ ___ ___ ___

Y Z

____ ____

Alphabet Symmetry

Teacher Prep: Cut out sets of letters and place in baggies for each group.

A B C D E F

G H I J K L

M N O P Q R

S T U V W X

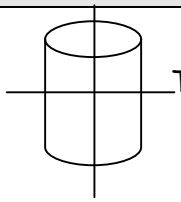
Y Z

Symmetry Scavenger Hunt

For Early Finishers

Directions:

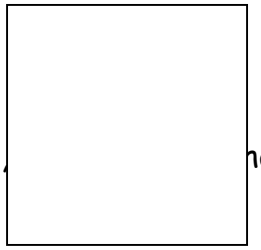
1. Explore the classroom by walking around the room to find objects that are ***symmetrical***.
2. Complete the chart below, **drawing** and **labeling** the symmetrical shape. Make sure you draw any lines of symmetry that you can identify.
3. Record the **number** of lines of symmetry for each in the right column.

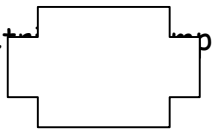
Draw and label symmetrical shape:	**How many lines of symmetry?**
Example:  Teacher's pencil holder	There are **two lines** of symmetry in my teacher's pencil holder.
	There are _____ lines of symmetry in _____ _____.
	There are _____ lines of symmetry in _____ _____.
	There are _____ lines of symmetry in _____ _____.
	There are _____ lines of symmetry in _____ _____.

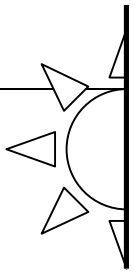
Exit Card

Day 1

1. Using what you have learned today, create an icon in the box below that represents the term "line of symmetry".

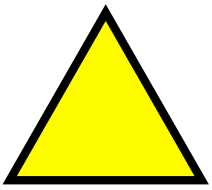
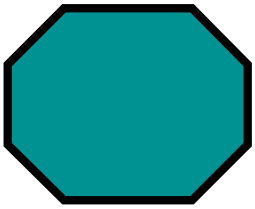
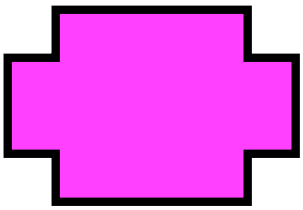
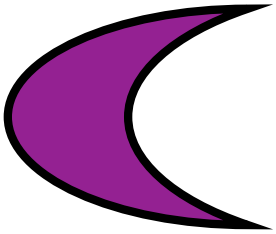
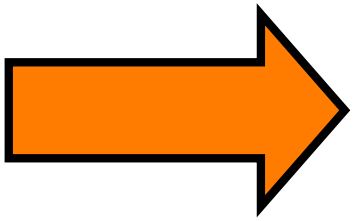
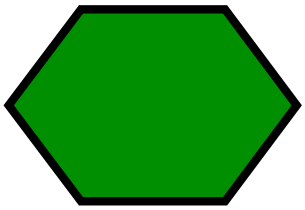
2. Draw the lines of symmetry,  hape below.

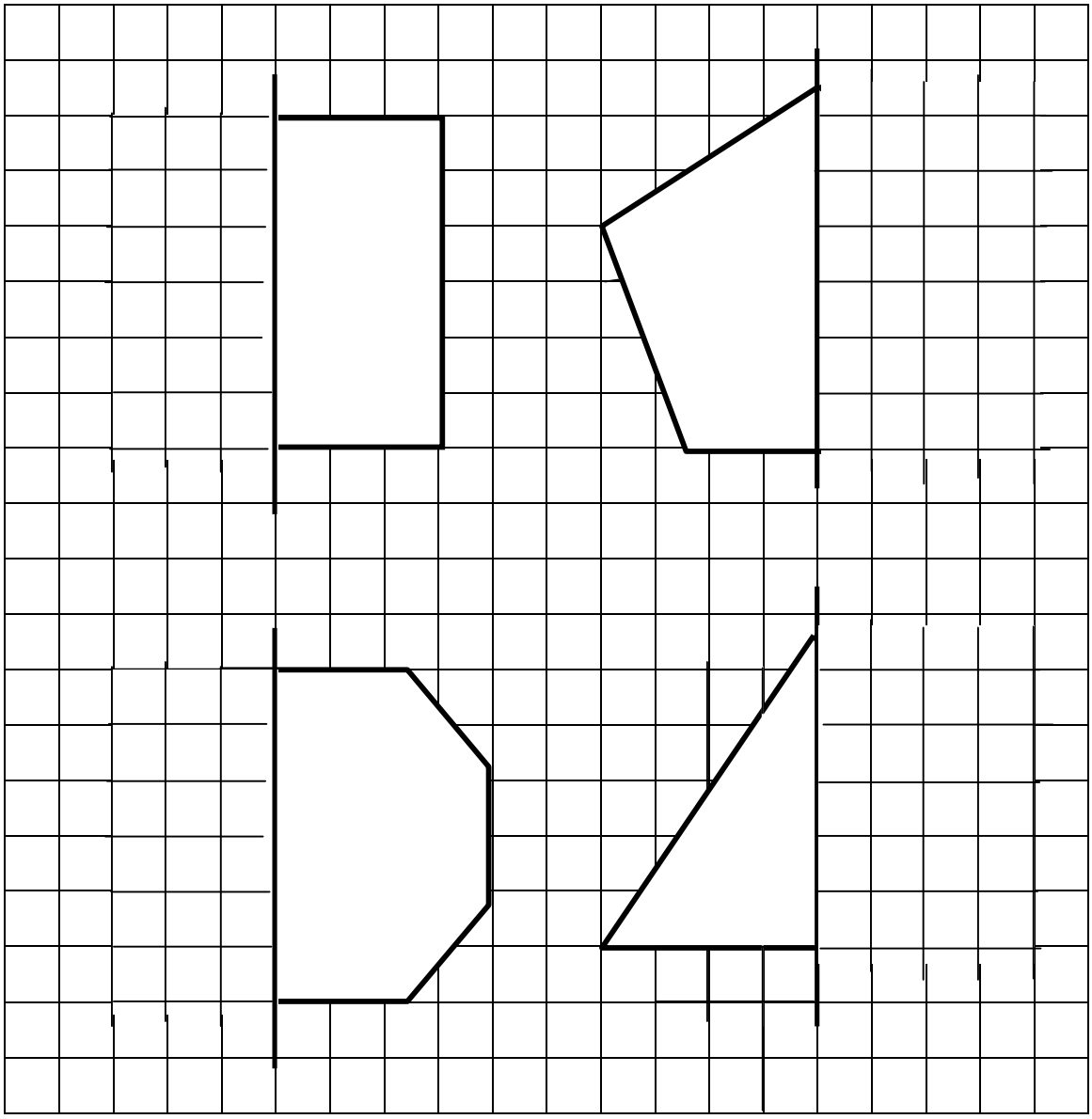
3. Make the shape below symme  pleting the other side.



Symmetry: Reteach Group

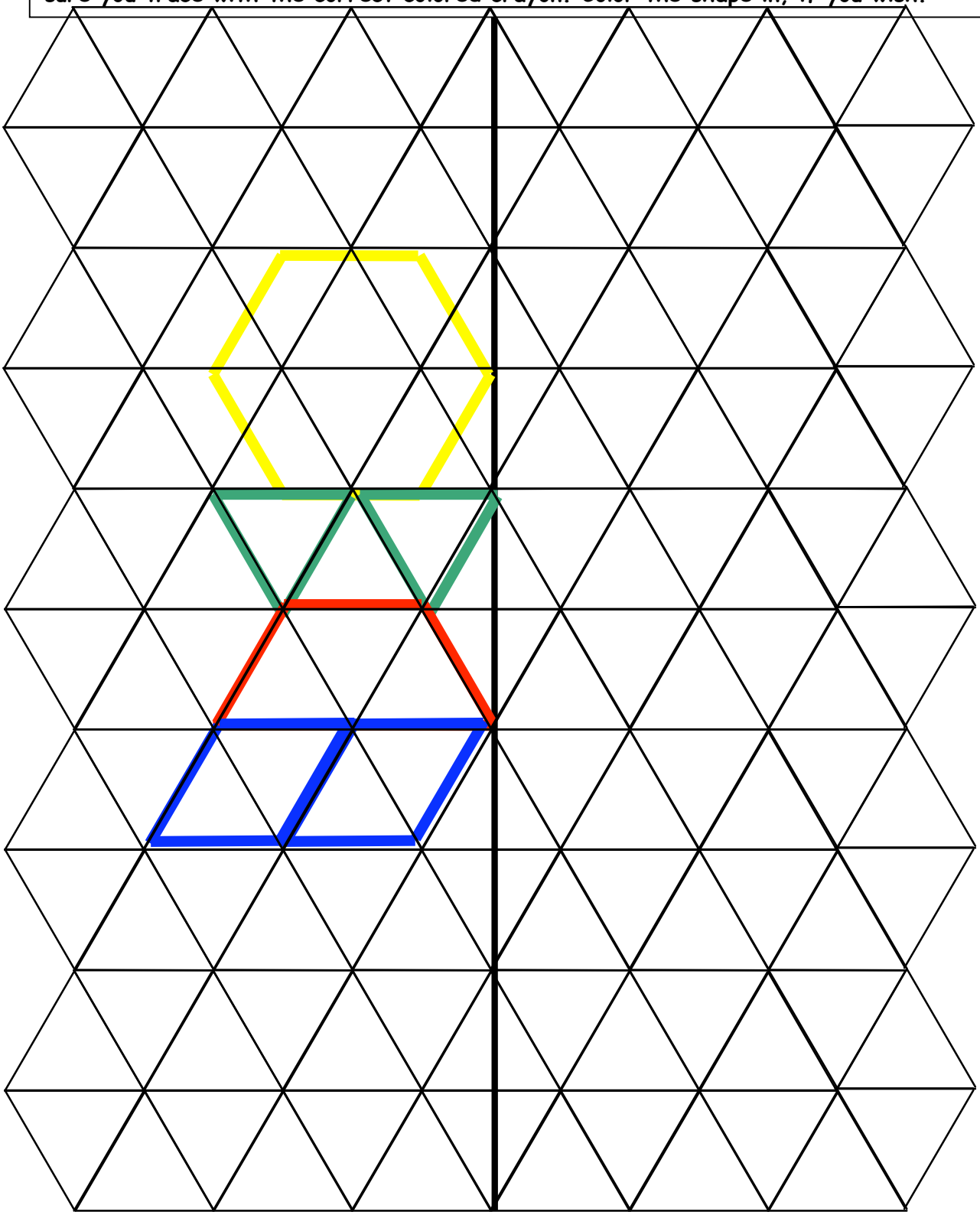
Directions: Identify the lines of symmetry within the shapes below.



Pattern Block Symmetry

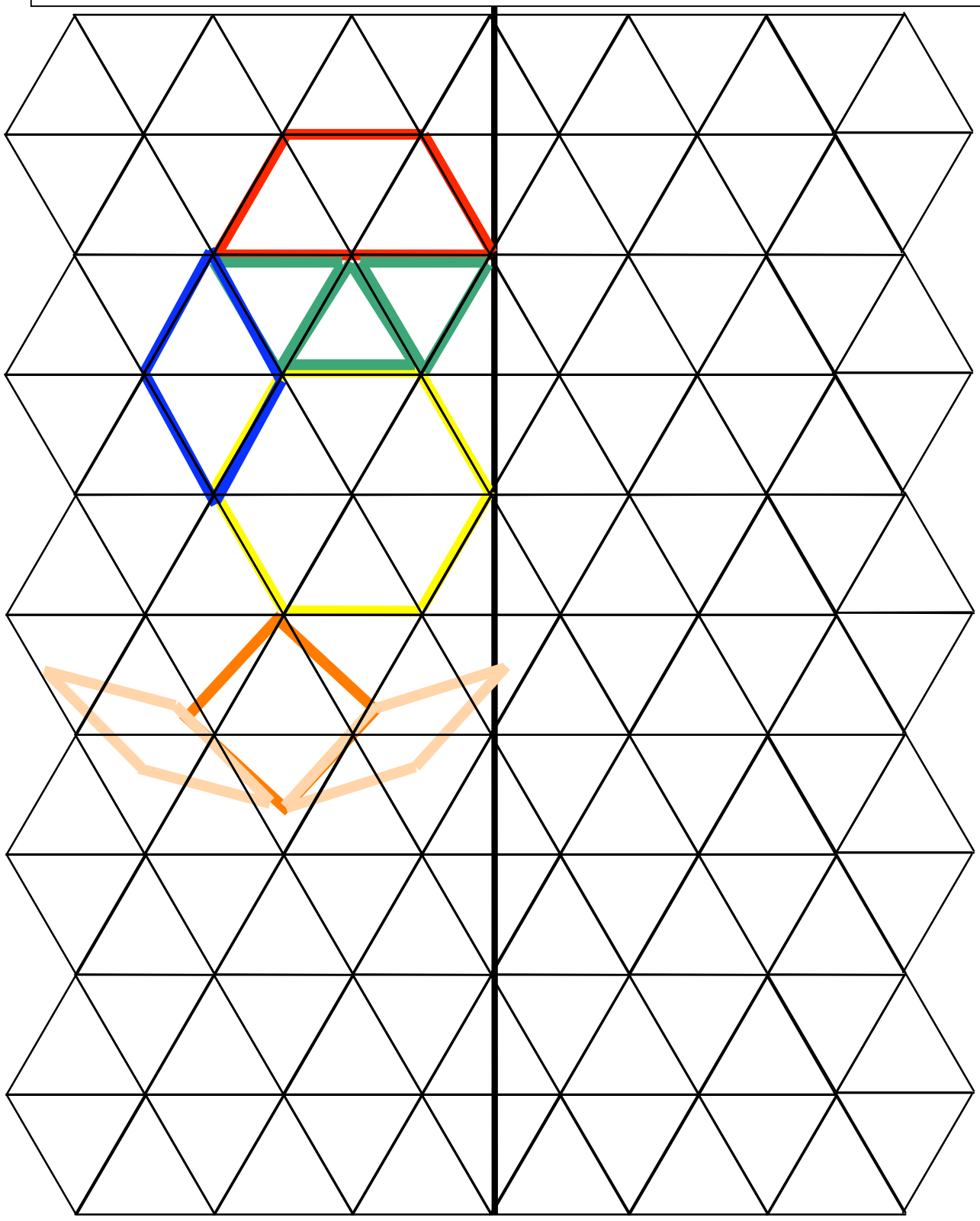
Directions: Work with your partner to complete the other half of the symmetrical figure using pattern blocks. You may use your mirror, if necessary, to check. Make sure you trace with the correct colored crayon. Color the shape in, if you wish.



Pattern Block Symmetry

Student Resource 10b

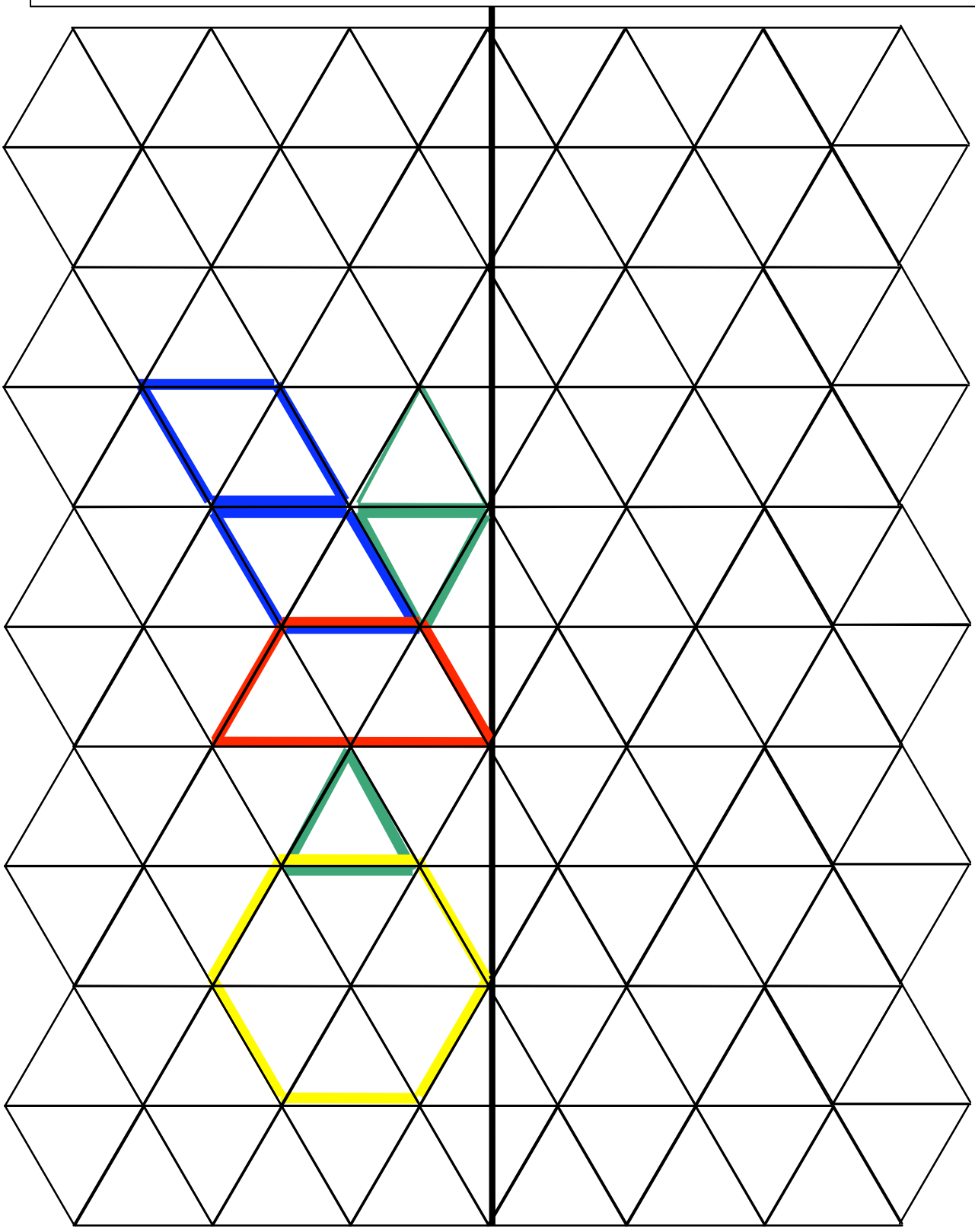
Directions: Work with your partner to complete the other half of the symmetrical figure using pattern blocks. You may use your mirror, if necessary, to check. Make sure you trace with the correct colored crayon. Color the shape in, if you wish.



Pattern Block Symmetry

Student Resource 10c

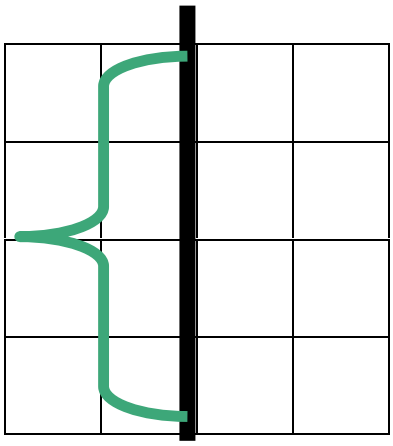
Directions: Work with your partner to complete the other half of the symmetrical figure using pattern blocks. You may use your mirror, if necessary, to check.



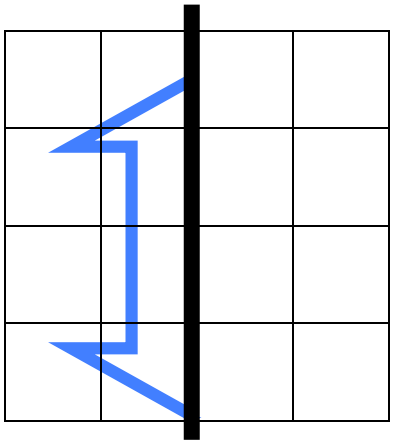
Silly Symmetry

Directions: Work independently to complete the missing sides of the symmetrical designs below.

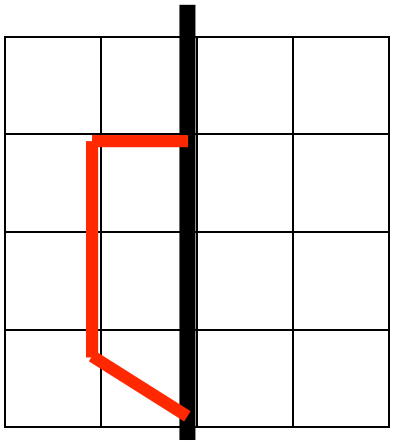
1.



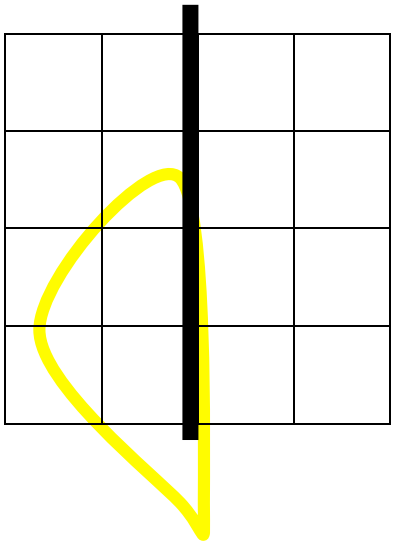
2.



3.



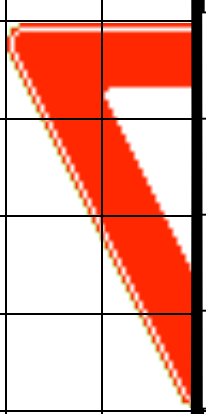
4.



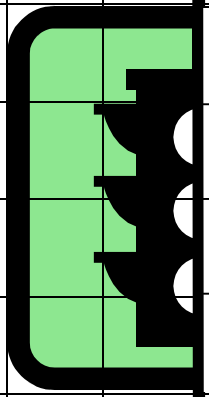
Symmetry Around the World: Assessment

Directions: Choose three out of four everyday objects below. Make each object symmetrical by drawing the missing half.

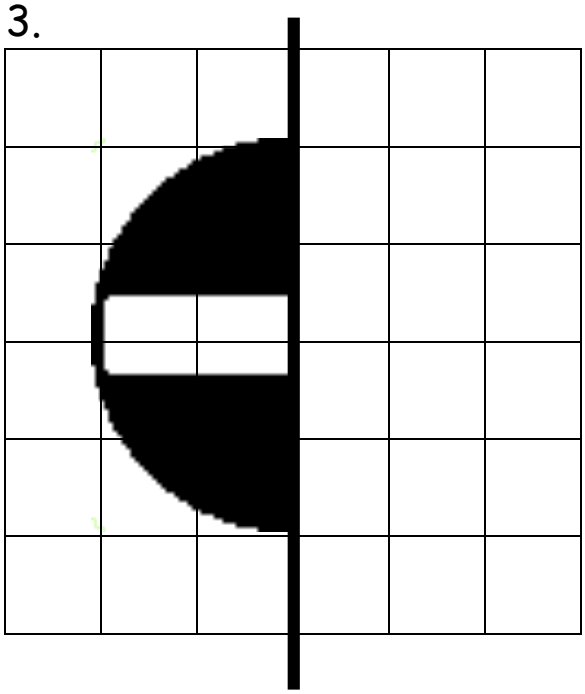
1.



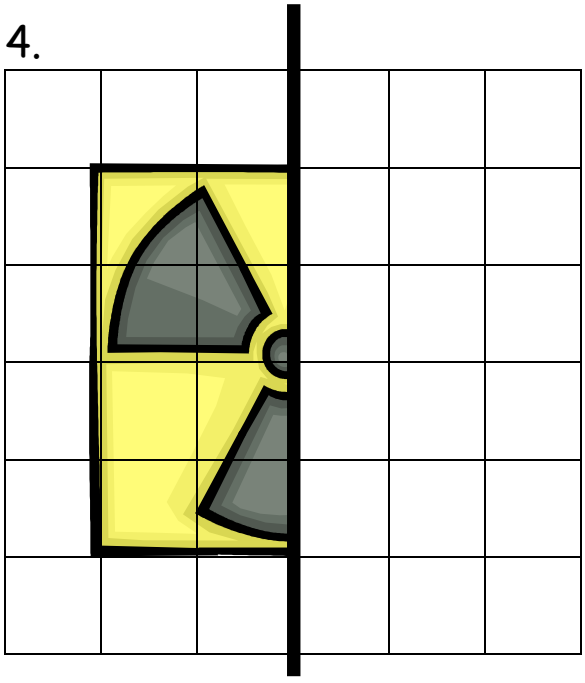
2.



3.



4.

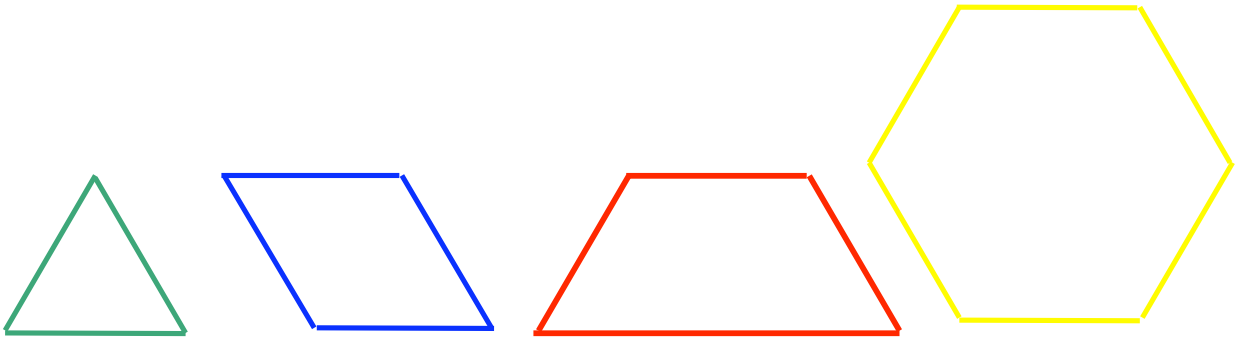


Reteaching Symmetry

Teacher Prep: Cut out each half of the figures below. Place pieces in baggies for each student.

Symmetry Sense

Directions: Use at least three of the different pattern blocks below to create a symmetrical picture worth between $1.75 and $2.50.



1 ¢ 5 ¢ 10 ¢ 25 ¢

- Explain **why** it is symmetrical.
- Draw a **line of symmetry** using a ruler.
- Write a **number sentence** to show how much your picture is worth.

Adapted from:

Challenging Mathematics Problems that Stretch Students' Thinking by Shari Sternberg and Gale Waibel.

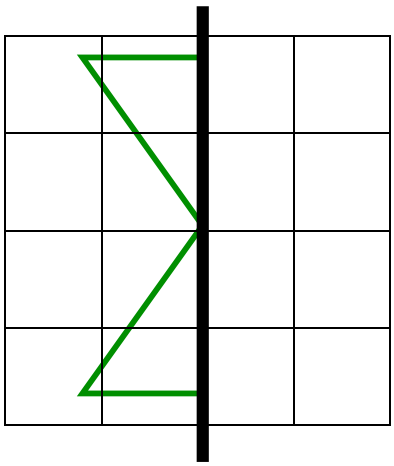
Symmetry in Your World

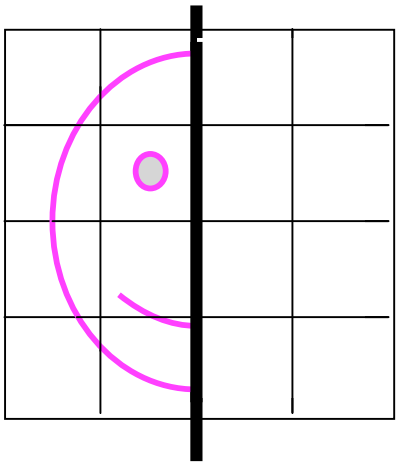
Assessment

Directions:

Part A.

Complete the missing half of the symmetrical figures below.

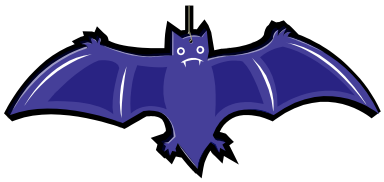
1. 

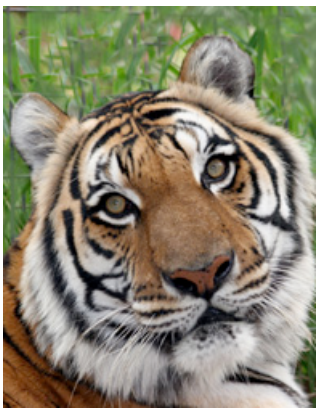
2. 

Part B.

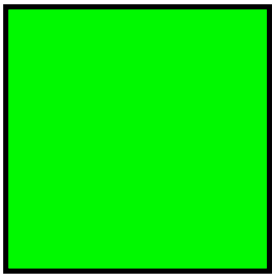
Draw the lines of symmetry on each figure below.

3. 

4. 

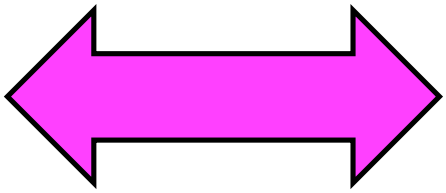
5. 

Part C. Multiple Choice



6. How many lines of symmetry does the above shape have?

○ a. 1
○ b. 3
○ c. 2
○ d. 4



7. How many lines of symmetry does the above figure have?

○ a. 3
○ b. 0
○ c. 1
○ d. 2

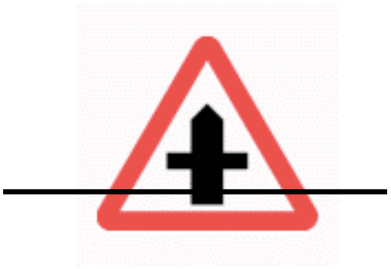
8. How many lines of symmetry does the above figure have?

○ a. 0
○ b. 1
○ c. 2
○ d. 3

Part D. BCR

Figure 1

Figure 2



Step A. Pretend you are a teacher grading Tommy's paper. Tommy was to draw a line of symmetry on the figures above. How many lines of symmetry did Tommy draw correctly?

Tommy drew _____ line(s) of symmetry correctly.

Step B.

Explain why your answer is correct.
Use what you know about symmetry and a line of symmetry in your answer.
You may use words and/or numbers in your explanation.

_____

_____

_____

_____

_____